forming a contact hole which penetrates an interlayer insulating film formed on a semiconductor substrate;

forming an electric conductive film on said interlayer insulating film whereby said contact hole is filled to obtain a contact to said substrate;

forming an insulating film on said electric conductive film;

patterning by an anisotropic etching said insulating film and said electric conductive film to form a configuration corresponding to said cylindrical portion so that the core and the bottom portion of said cylindrical portion are formed;

[the step of] forming the cylindrical portion on the side of [the] said core and [the] said bottom portion wherein an outer wall of [the] said cylindrical portion is roughened, [comprises] comprising forming a [amorphous] film containing silicon on said core and said bottom portion; roughening an outer surface of said [amorphous] film containing silicon by forming silicon grains in the outer surface of it; and conducting an anisotropic etching for patterning to form a side-wall like cylindrical portion at the side of said core and said bottom portion;

removing said core;

forming a dielectric film to cover said cylindrical storage node comprising said cylindrical portion and said bottom portion; and

forming a cell plate on said dielectric film, whereby a capacitor constituted by said cylindrical storage node, said dielectric film and said cell plate is formed.

7. (Amended) A method for producing a semiconductor device [according to Claim 5, wherein] having a cylindrical storage node comprising a bottom portion and a

cylindrical portion which surrounds an outer circumference of said bottom portion and extends upward, which comprises steps of:

forming a contact hole which penetrates an interlayer insulating film formed on a semiconductor substrate;

forming an electric conductive film on said interlayer insulating film whereby said contact hole is filled to obtain a contact to said substrate;

forming an insulating film on said electric conductive film;

a step of patterning by an anisotropic etching said insulating film and said electric conductive film to form a configuration corresponding to said cylindrical portion so that the core and the bottom portion of said cylindrical portion are formed;

[the step of] forming the cylindrical portion on the side of said core and [the] said bottom portion wherein an outer wall of [the] said cylindrical portion is roughened, [comprises] comprising forming amorphous silicon on said core and said bottom portion; conducting an anisotropic etching to form a side-wall like cylindrical portion at the side of said core and said bottom portion; and roughening an outer surface of said amorphous silicon by forming silicon grains in the outer surface of it to thereby form said cylindrical portion;

removing said core;

forming a dielectric film to cover said cylindrical storage node comprising said cylindrical portion and said bottom portion; and

forming a cell plate on said dielectric film, whereby a capacitor constituted by said cylindrical storage node, said dielectric film and said cell plate is formed,

wherein the inner wall of the cylindrical portion having a roughened outer wall is constituted by amorphous silicon.

8. (Amended) A method for producing a semiconductor device according to Claim 6, wherein the roughening of the outer surface of the [amorphous] film containing silicon is selected from the group consisting of a heat treatment with use of silane and a heat treatment in vacuum after a treatment to the outer surface of said [amorphous] film containing silicon with use of hydrofluoric acid, whereby projections and recesses are formed in the outer wall of said amorphous silicon by forming silicon grains in the outer wall.

10. (Amended) A method for producing a semiconductor device according to Claim 8, wherein the inner wall of the cylindrical portion having a roughened outer wall is constituted by said film containing silicon, said film containing silicon including amorphous silicon.

12. (Amended) A method for producing a semiconductor device having a cylindrical storage node comprising a bottom portion and a cylindrical portion which surrounds an outer circumference of said bottom portion and extends upward, which comprises steps of:

[a step of] forming a contact hole which penetrates an interlayer insulating film formed on a semiconductor substrate;

[a step of] forming an electric conductive film on said interlayer insulating film whereby said contact hole is filled to obtain a contact to said substrate;

[a step of] forming an insulating film on said electric conductive film;

[a step of] patterning by an anisotropic etching said insulating film and said electric conductive film to form a configuration corresponding to said cylindrical portion so that the core and the bottom portion of said cylindrical portion are formed;

[a step of] forming the cylindrical portion on the side of said core and said bottom portion wherein an outer wall of said cylindrical portion is roughened;

[a step of] forming a dielectric film on said cylindrical storage node comprising said cylindrical portion and said bottom portion within which said core remains; and

[a step of] forming a cell plate on said dielectric film, whereby a capacitor constituted by said cylindrical storage node, said dielectric film and said cell plate is formed.

13. (Amended) A method for producing a semiconductor device according to Claim 12, wherein the step of forming the cylindrical portion on the side of the core and the bottom portion wherein [an] the outer wall of the cylindrical portion is roughened, comprises forming amorphous silicon on said core and said bottom portion; roughening an outer surface of said amorphous silicon by forming silicon grains in the outer surface of it; and conducting an anisotropic etching for patterning to form a side-wall like cylindrical portion at the side of said core and said bottom portion.